CLAIMS

What is claimed is:

5   1. A method of finger printing a process tool for processing a workpiece, the
method being performed using a data record representing a parameter of the
process, the method comprising the steps of:
   A. detecting transition points in the data record so as to define data intervals
      wherein each interval comprises the data between successive transition
10   points;
   B. computing a best fit of the data in each of the data intervals using basis
      functions; and
   C. computing fitting errors between the data in the data intervals and the best fit,
      and determining if the errors are less than a predetermined threshold, and
15   recursively finding additional transition points as necessary to produce fitting
      errors less than the threshold.

   2. The method of claim 1 wherein step A comprises finding time points at which
there is a sudden change in behavior of the data record.
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   3. The method of claim 1 wherein step A comprises numerically differentiating the
data record and searching for points at which the second derivative exceeds a
predetermined threshold.

25   4. The method of claim 1 wherein step A comprises numerically differentiating the
data record wherein the data record comprises temperatures as a function of time
and searching for points at which the second derivative exceeds a predetermined
threshold.

5. The method of claim 1 wherein step B comprises fitting the data intervals using a set of basis functions that include at least one of linear functions, exponentials, double exponentials, and sinusoids, polynomials, and other standard basis functions.

6. The method of claim 1 wherein step C comprises adding an additional transition point if the fitting error exceeds the threshold.

7. The method of claim 6 further comprising repeating step C until the fitting error is less than or substantially equals the threshold.

8. The method of claim 1 further comprising saving the transition points and the detected data intervals.

9. The method of claim 1 wherein the workpiece comprises a semiconductor wafer for fabricating electronic devices and the parameter of the process is a parameter for fabricating electronic devices.

10. The method of claim 1 wherein the workpiece comprises a semiconductor wafer and the parameter of the process is a parameter selected from the group consisting of etch rate, plasma potential, and RF power.

11. The method of claim 1 wherein the workpiece comprises a semiconductor wafer and the process is selected from the group consisting of post-exposure bake, plasma etching, plasma deposition, plasma enhanced chemical vapor deposition, chemical vapor deposition, and sputter deposition.

12. The method of claim 1 wherein the workpiece comprises a semiconductor wafer and the parameter of the process is the temperature of the workpiece as a function of time.

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13. A method of matching a first data set and a second data set where the first data set and the second data set include an operating characteristic for a process, the method comprising the steps of:

  i. fingerprinting the first data set and the second data set;

  ii. finding correspondences between transition points in the first data set and the second data set; and

  iii. comparing the first data set and second data set to determine whether the first data set and the second data set match.

14. The method of claim 13 further comprising displaying the comparison results from step iii.

15. The method of claim 13 further comprising generating an alarm if the first data set and second data set do not match.

16. The method of claim 13 wherein the first data set and second data set include the operating characteristic being a function of time; the method further comprising time-stretching at least one portion of the first data set and of the second data set by inserting interpolated values so as to produce an equal number of data points in each portion of the data sets, so that the first data set and the second data set have substantially the same time reference for step iii.

17. The method of claim 13 wherein step i comprises:

  A. detecting transition points in the first data set and the second data set so as to define data intervals wherein each interval comprises the data between successive transition points;

B. computing a best fit of the data in each of the data intervals using basis functions; and

C. computing fitting errors between the data in the data intervals and the best fit and determining if the errors are less than a predetermined threshold and recursively finding additional transition points as necessary to produce fitting errors less than the threshold.

18. The method of claim 13 wherein the process comprises an electronic device fabrication process and the first data set comprises temperatures of a semiconductor wafer as a function of time and the second data set comprises temperatures of a semiconductor wafer as a function of time.

19. The method of claim 13 wherein the process comprises an electronic device fabrication process.

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20. A method of matching a first data set and a second data set where the first data set and the second data set include temperature measurements as a function of time for a process performed on a semiconductor wafer in a process tool, the method comprising the steps of:

i. fingerprinting the first data set and the second data set using the steps of

A. detecting transition points in the first data set and the second data set so as to define data intervals wherein each interval comprises temperature data between successive transition points;

B. computing a best fit of the temperature data in each of the data intervals using basis functions; and

C. computing fitting errors between the temperature data in the data intervals and the best fit and determining if the errors are less than a

predetermined threshold and recursively finding additional transition

points as necessary to produce fitting errors less than the threshold;

  ii. finding correspondences between transition points in the first data set and the

second data set; and

5   iii. comparing the first data set and second data set to determine whether the first

data set and the second data set match.